Dissertation

by Mohd Shahrizan Sabli

GRAB UR PC: A Website on Custom PC Build Guide & Planner

by

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16295

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Abstract

There are abundance or mobile or websites/web applications related to custom PC but most of them only provide standalone functionality. A one-stop-center medium would give more convenience to user as they do not need to use different kind of application for different functionality. This project aims to develop a website which provides all the important functionalities for custom PC enthusiasts and beginners including guidance to users on identifying hardware components and assembling the components into a custom PC, application to personally plan their PC builds by selecting hardware components to suit their interests, and online sales service for participating hardware retailers. A survey has been conducted to gauge people interest in custom PC and their level of knowledge with regards to it. The preliminary results show that many people are interested to own a custom PC, despite have not adequate knowledge about the hardware components and installing the components on their own. But they are still willing to learn about the subject. A user-friendly and comprehensive website on custom PC will help them get into the world of custom PC without too much difficulty.

Acknowledgement

In completion of this FYP II Dissertation Report, the author would like to extend his heartfelt appreciation to the following individuals who have made his FYP experience very interesting, momentous as well as meaningful.

The author would also like to extend special thanks to his supervisor, Mr. Faizal Ahmad Fadizil for guiding, monitoring as well as coaching the author throughout the FYP I and FYP II duration. Not to forget, the author would like to express his appreciation to C-Zone, Cycom, and Jayacom for giving the author the permission to include the pricelists in the website. The author also would like to give his thanks to the respondents who had participate in the online survey and the user acceptance testing for their feedbacks and suggestions are important for the author to improve the website.

Last but not least, sincere thanks to the author's family and friends for their support and encouragement throughout the FYP I and FYP II. It goes without saying that the author could apply these invaluable experiences, skills and knowledge gained throughout the FYP period as part of his future career development.

Chapter 1 – Introduction

1.0 Background

Today, there are abundance of custom Personal Computer (PC) building guides and tutorials in the form of mobile and web applications being available to custom PC enthusiasts and beginners. These mobile and web applications are freely available for use such as *Build a PC*, *Build a Computer, The PC Constructor Beta*, and *PCPartPicker*. There are also mobile and web applications, such as *PCPartPicker* and *PCPartPicker Mobile*, which allow users to customize and experiment with their own custom PC builds by selecting the hardware components to suit their interests. Others provide users with online sale services to purchase hardware components for their custom PC. In general, the aim of these mobile and web applications is to support Do-It-Yourself/DIY custom PC trend the in their own way by making it convenient for PC enthusiasts and beginners alike to build a custom PC contribute. However, each of these these mobile and web applications only specialize in only one functionality which means users will have to download or use different applications just to access to each functionality. It will be more convenient for users to access these functionalities (custom PC installation guide, planning custom PC builds, and purchase hardware components online) using only a single application.

1.1 Problem Statement

The problem statement for the project is there is a lack of a one-stop-center web or mobile application specifically for custom PC enthusiasts and beginners to learn about building a custom PC, planning and customizing their custom PC builds, and purchasing hardware components online.

- To begin with, there are many online hardware retailers such as *PC Depot Online*, *TMT.My*, and *Redcom Computer* but their websites only provide online sale services to users and **do not provide guidance to users on identifying hardware components and assembling the components into a custom PC.** The possible reason is these retailers are dedicated to selling hardware components online; they

are not aiming to educate users about building a custom PC as users can easily find other websites to learn about building a custom PC.

- Besides, despite that users can learn about hardware components and assemble them into a custom PC using mobile applications or visiting websites such as *Build a PC*, *Build a Computer*, and *Lifehacker*, these applications **do not provide users with medium to personally plan their PC builds by selecting hardware components to suit their interests.** Users have the option to use *PCPartPicker*, but this website is targetted for users from Australia, Europe, New Zealand, and North America due to their larger custom PC enthusiast base. For that reason, the website do not reflect the availability and prices of hardware components in Malaysia. Users from Malaysia may not be able to entirely rely on the custom PC builds created using these mobile and web applications due to the price of hardware components exceeding their budgets or the hardware components are unavailable in this country.

- In addition, there are local retailers such as *Cycom* and *C-Zone* that release their pricelists through their websites but these websites **lack online sale services.** Users can only view the prices and the availability of hardware components at their stores through the pricelists. The possible reason is these retailers only operate as brick-and-mortar (B&M) businesses and only sell commercial off-the-shelf hardware components so delivery service is unavailable and buyers will have to travel to the stores to do the purchasing.

1.2 Objectives

The aim of this project is to develop a web application for custom PC enthusiasts and beginners which will act as a one-stop-center for user to learn about custom PC building, plan atheir PC builds, and purchase hardware components. In order to fulfill the aim, the following objectives will need to be met:

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- To provide a medium for users to learn about PC components and step-by-step procedures to assemble PC components into a PC.

- To provide a proper medium for users to plan and customize their PC builds, by selecting PC components based on their interests and budgets. The PC components listed reflect the prices and availability of the components in Malaysia as the components are taken from pricelists released by major PC components retailers. This will also allows users to compare the prices and the availability of PC components at one store with another.

- To provide online sales service to selected PC components retailers participating in the project.

1.3 Scope

The following is the scope of the project:

- The web application do not cover method to overclock the CPU and GPU of a PC

- The web application only covers several hardware retailers around Kuala Lumpur and Selangor due to the limited time frame of the project.

Chapter 2 – Literature Review

2.1 Custom PC

Custom PC, also known as custom-built computers or homebuilt computer is defined as a computer that is built by assembling compatible hardware components. In general, these components are available as commercial off-the-shelf (COTS) components and consist of the following items:

No.	Components	Quantity
1	Central Processing Unit (CPU)	1
2	CPU cooler (air cooler or liquid cooler)	At least 1
3	Motherboard	1
4	Memory	At least 1
5	Storage (Hard Disk Drive/HDD and Solid State Drive/SSD)	At least 1
6	Graphic Processing Unit (GPU)	1
7	Power supply	1
8	Case	1
9	Operating system (Windows, Mac OS, Linux, etc.)	At least 1
10	Optical drive	1 (optional)
11	Monitor	At least 1
12	Expansion cards/Networking (sound card, wired network adapter, and wireless network adapter)	1 (optional)
13	Peripheral (mouse, keyboard, speaker, headphone, etc.)	1 mouse and 1 keyboard; others are optional
14	Accessories (case fans, fan controllers, etc.)	Optional

Table 1: Important hardware components by category

Despite that custom PCs are almost always used at home, they are not the same as home PCs because the latters were already pre-assembled by the manufacturers such as *Dell*, *Hewlett-Packard (HP)*, and *ASUS* (Wikipedia, n.d.). People have the option to customize their custom PCs' specifications to best suit their desires by selecting the appropriate hardware components, as opposed to home PCs which specifications and hardware components were already set by their manufacturers. Kyrnin (n.d.) stated that people will

more likely to minimize the cost by building their own custom PCs as the more powerful their intended custom PCs will be. The reason is manufacturers tend to include unnecessary premium components in their home PCs in order to increase profits. He also added that small companies still have to increase the price even if the companies may use the very same parts that buyers want in order to cover the assembling cost and and the after-purchase supplier support cost. While many of the small companies that build high end systems may build a PC from the exact parts that you want, they have to mark up the price in order to cover their costs for building it and supplier support after the purchse.

Graziano (2013) reminded that people may face the risk of receiving lack of help from support organization in case they run into problems with their custom PCs. This is because each hardware component are likely will be purchased from different manufacturer and store and people will have to refer to appropriate company to solve the problems you will have to deal (Kyrnin, n.d.). On the other hand, in the case of problems with pre-built home PCs, purchasers only have to refer the problems with the manufacturer and their warranty service groups. Not to mention that a poorly-designed custom PC may run into problems which will be exposed during testing after people have finished assembling the hardware components. People may find out that the elegent cases that they have bought may provide poor ventilation or a particular hardware component is not compatible with the others and need to be replaced. For that reason, before attempting to build a custom PC, it is strongly advised for beginners to have an adequate knowledge about hardware components and custom PC assembling processes, or an expert to foresee and guide them for the duration of the processes to minimize the risk of running into failures.

2.2 E-Commerce

Electronic commerce, also known as e-commerce, is generally defined as any foms of business transactions that are conducted over an electronic network, such as the Internet. According to research conducted by Euromonitor International, total e-commerce transaction In 2011 was RM842 million and the figure is expected to surpass RM1.9 billion by 2016, which may be attributed to the country's high internet penetration (61%).

Harn, Ali Khatibi, and Hishamudin (2006) stated that the reason for customers to shop online is they find their choices dramatically increased. The explained that when making purchasing decisions, the customers have access to much more information. E-commerce is appealing to time-constrained customers because they can save time and not required to travel to physical stores to do the purchasing. This is supported by Parsons (2002), who remarked that consumers are desperate to spend their non-working time in more recreational pursuits. Margherio (1998) highlighted that lower operating cost for many online businesses, besides better and superior access to information, may drive price reductions or quality improvements

Another factor that may influence consumers to shop online is ease of research in finding product information. Consumers can searches for product information more effectively and efficiently using the Internet as compared to traditional channels. Rowley (2000) stated that this can be accomplished by employing browser and intelligent search agents such as comparison shopping agents which are specifically designed to simultaneously locate and compare products prices across multiple online retailers. As a result, the purchasing process on the Internet may become much simpler and faster for the consumers.

2.3 Database Management System

A database management system (DBMS) is defined as a software application that interacts with users, other applications, as well as the database for the purpose of data collection and analyzation (Wikipedia, n.d.). A DBMS for general purpose is designed to enables e definition, creation, querying, update, and administration of databases. Thakur (n.d.)

pointed out that using a DBMS to manage data can help to enforced integrity. As a resuly, data in database will be always accurate, considering that incorrect information cannot be stored in database. This is really important to maintain a website that display a large number of details related to hardware components to ensure that the details are accurate and reliable. He also stressed that users can avoid inconsistency. Whenever the same data is duplicated and changes are made at one site, it gives rise to inconsistency and the two entries regarding the same data will not agree., resulting in data inconsistency By removing the inconsistent data, it is more likely to remove redundancy as well. Another important aspect of a DBMS is that it provides backup and recovery resulted by hardware or software failures. For an instance, if the computer system fails in the middle of a complex update program, the recovery subsystem is will restore the database to the state it was in before the program started executing. This could help the website from losing important data when a hardware or software failures occurs.

2.4 Web application

Web application, also known as web-based application, is a type of application which utilizes a website as the interface. Users are able to access the application using a standard web browser from any computers or mobile devices, instead of having to install the application on their computers or devices. Lingham (2007) explained tha tan advantage of developing a web application is that it is platform independent. Developers do not have to build a technology around a specific platform and limit their market. In addition, it does not require high device specification to use meaning uses can use it even if they are using a low-end devices. Another benefits is that it does not rely on any channel but the web browser and the internet to distribute the application to the users, resulting in possible low cost global distribution.

2.5 Fresh Content

In SEO (search engine optimization) terminology, fresh content is defined as content that is new or dynamic and able to attract people to vist a website. The general consensus among SEO experts is they believe that website may obtain better placement on search engine results page (SERP) by consistently using up-to-date contents. Decarlo (n.d.) explained that by providing fresh contents to the visitors, they are more likely to return to a website often since they know it will be regularly and consistently updated. As a result, this can help to boost the website's ranking and overall website performance, considering that the website is receiving substantial traffic. He also added that a website can provide its prospective customers with the information they seek by keeping itself updated. A website may appear dynamic and appealing to its visitors they that they will be inclined to spend more time clicking around and absorbing information provided, increasing the overall website performance since the visitors are interacting with the website. This is supported by Limelight Networks (2014) through its survey on "State of the User Experience", which reveals that 38% respondents believed that fresh and updated content is the most important thing that they will expect from a website and 29% of them considered it as the second most important thing. In terms of an online store, it should constantly update the information of products sold (price, availability, new products, etc.) to instill confidence in its prospective customers of its relevency and reliability.

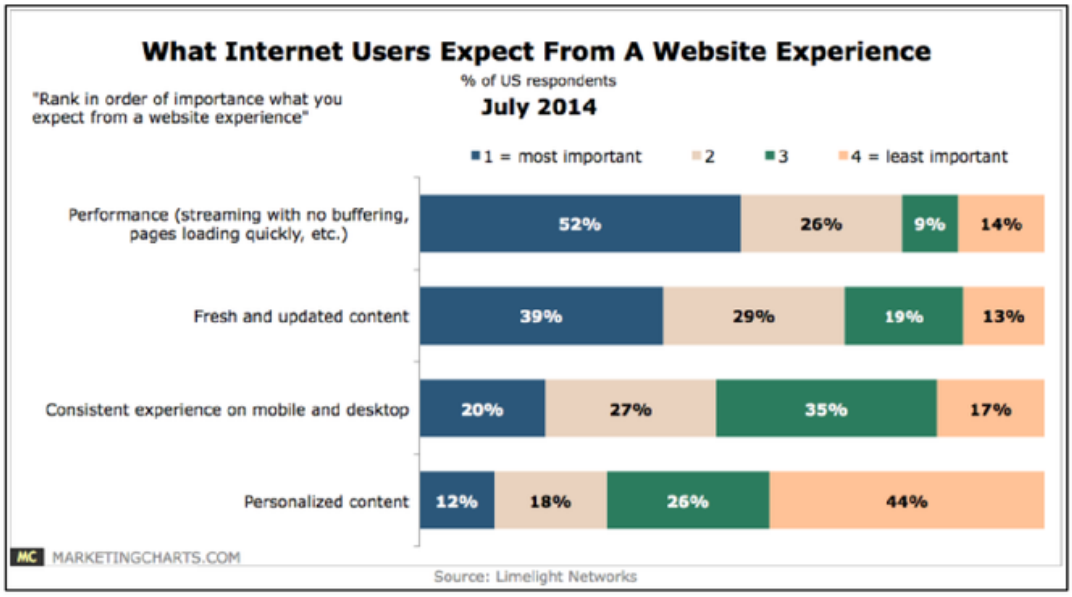


Figure 1: Results of "State of the User Experience" survey conducted by Limewire Networks

2.6 Existing Systems

As the author has mentioned earlier, currently there is a lack of a all-in-one web or mobile applications specifically for custom PC enthusiasts and beginners in Malaysia to learn about building a custom PC, planning and customizing their custom PC builds, and purchasing hardware components online. However, there are abundance of these applications that focus on only one of the aforementionted functionalities, or could be futher improved by implementing the functionalities into the applications.

Cycom

The Cycom Sale & Service Sdn. Bhd. is a hardware components retailer established in 1997 in Kuala Lumpur. Besides selling hardware components, the company also Apple products and portable computers (laptop, notebook, etc.). The company is one of the most renowned retailers in Malaysia, as evidenced by the title "Top Ten Reputable Computer Retailers Website to refer" by Sin Chew Jit Poh. Realizing that Information Technology (IT) consumers in Malaysia often face difficulties in getting satisfactory after-sales service, the company strives to improve its customers after-sales experience by

maintaining a dedicated Technical Support Department for any assistance and inquiry. The company has an official website which showcases their product selections through their pricelists and highlights their current promotions.

Figure 2: The home page of Cycom's official website

However, a glaring flaw of the website is the lack of online sale services. The website even lacks a proper interface to view their product selections. To view their product selections, a customer has to download their price lists. He/she has to send an email to the company in order to confirm their purchase by including his/her full name, contact number, e-mail address, address for delivery, and product of purchase. The customer can only proceed with the payment once their sales representative has confirm the stock, price, and delivery charge via an e-mail or SMS. The payment method available is only bank-in via interbank transfer/ bank counter/ GIRO/ cheque and sending the proof of payment to the company via fax or email.

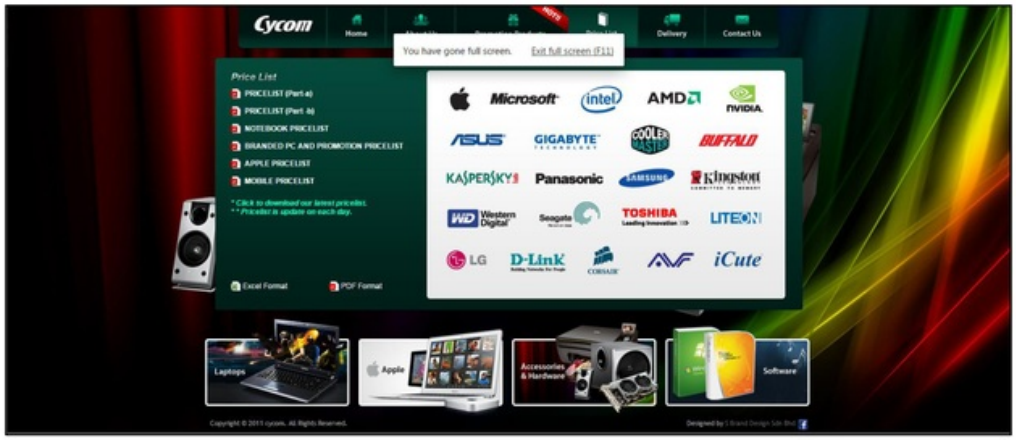
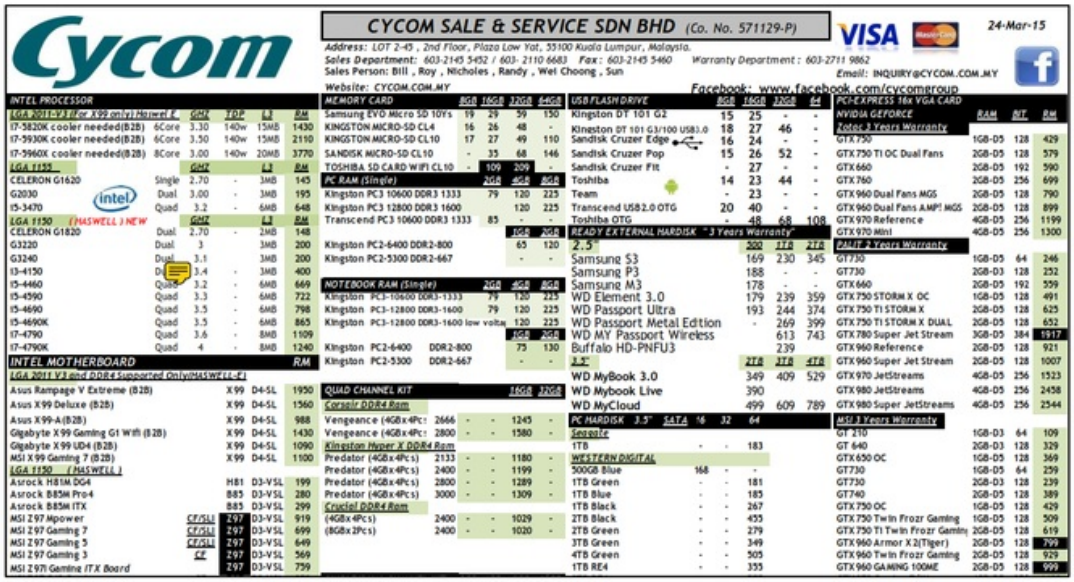


Figure 3: The page to download all price lists

Figure 4: The method of payment for a purchase



CYCOM SALE & SERVICE SDN BHD (Co. No. 571129-P)

24-Mar-15

Address: LOT 2-45 , 2nd Floor, Plaza Low Yat, 55100 Kuala Lumpur, Malaysia.
Sales Department: 603-2145 5452 / 603- 2110 6683 Fax: 603-2145 5460 Warranty Department : 603-2711 9862
Sales Person: Bill , Roy , Nicholes , Randy , Wei Choong , Sun Email: INQUIRY@CYCOM.COM.MY
Website: CYCOM.COM.MY Facebook: www.facebook.com/cycomgroup

INTEL PROCESSOR		GHZ	TDP	L3	RM
LGA 2011-V3 (For X99 only) Haswell E					
I7-5820K cooler needed(B2B)	6Core	3.30	140w	15MB	1430
I7-5930K cooler needed(B2B)	6Core	3.50	140w	15MB	2110
I7-5960X cooler needed(B2B)	8Core	3.00	140w	20MB	3770
LGA 1155		GHZ		L3	RM
CELERON G1620	Single	2.70	-	3MB	145
G2030	Dual	3.00	-	3MB	195
I5-3470	Quad	3.2	-	6MB	648
LGA 1150 (HASWELL) NEW		GHZ		L3	RM
CELERON G1820	Dual	2.70	-	2MB	148
G3220	Dual	3	-	3MB	200
G3240	Dual	3.1	-	3MB	200
I3-4150	Dual	3.4	-	3MB	400
I5-4460	Quad	3.2	-	6MB	669
I5-4590	Quad	3.3	-	6MB	722
I5-4690	Quad	3.5	-	6MB	798
I5-4690K	Quad	3.5	-	6MB	865
I7-4790	Quad	3.6	-	8MB	1109
I7-4790K	Quad	4	-	8MB	1240

INTEL MOTHERBOARD			RM
LGA 2011 V3 and DDR4 Supported Only(HASWELL-E)			
Asus Rampage V Extreme (B2B)	X99	D4-SL	1950
Asus X99 Deluxe (B2B)	X99	D4-SL	1560
Asus X99-A (B2B)	X99	D4-SL	988
Gigabyte X 99 Gaming G1 Wifi (B2B)	X99	D4-SL	1430
Gigabyte X 99 UD4 (B2B)	X99	D4-SL	1090
MSI X 99 Gaming 7 (B2B)	X99	D4-SL	1100
LGA 1150 (HASWELL)			
Asrock H81M DG4	H81	D3-VSL	199
Asrock B85M Pro4	B85	D3-VSL	280
Asrock B85M ITX	B85	D3-VSL	299
MSI Z97 Mpower	CF/SLI	Z97 D3-VSL	919
MSI Z97 Gaming 7	CF/SLI	Z97 D3-VSL	699
MSI Z97 Gaming 5	CF/SLI	Z97 D3-VSL	649
MSI Z97 Gaming 3	CF	Z97 D3-VSL	569
MSI Z97I Gamine ITX Board		Z97 D3-VSL	759

MEMORY CARD	8GB	16GB	32GB	64GB
Samsung EVO Micro SD 10Ys	19	29	59	150
KINGSTON MICRO-SD CL4	16	26	48	-
KINGSTON MICRO-SD CL10	17	27	49	110
SANDISK MICRO-SD CL10	-	35	68	146
TOSHIBA SD CARD WIFI CL10	-	109	209	-

PC RAM (Single)	2GB	4GB	8GB
Kingston PC3 10600 DDR3 1333	79	120	225
Kingston PC3 12800 DDR3 1600		120	225
Transcend PC3 10600 DDR3 1333	85	-	-
		16GB	32GB
Kingston PC2-6400 DDR2-800		65	120
Kingston PC2-5300 DDR2-667		-	-

NOTEBOOK RAM (Single)	2GB	4GB	8GB
Kingston PC3-10600 DDR3-1333	79	120	225
Kingston PC3-12800 DDR3-1600	79	120	225
Kingston PC3-12800 DDR3-1600 low volta		120	225
		16GB	32GB
Kingston PC2-6400 DDR2-800		75	130
Kingston PC2-5300 DDR2-667		-	-

QUAD CHANNEL KIT			16GB	32GB
Corsair DDR4 Ram				
Vengeance (4GBx4Pcs	2666	-	1245	-
Vengeance (4GBx4Pcs	2800	-	1580	-
Kingston Hyper X DDR4 Ram				
Predator (4GBx4Pcs)	2133	-	1180	-
Predator (4GBx4Pcs)	2400	-	1199	-
Predator (4GBx4Pcs)	2800	-	1289	-
Predator (4GBx4Pcs)	3000	-	1309	-
Crucial DDR4 Ram				
(4GBx4Pcs)	2400	-	1029	-
(8GBx2Pcs)	2400	-	1020	-

USB FLASH DRIVE	8GB	16GB	32GB	64
Kingston DT 101 G2	15	25	-	-
Kingston DT 101 G3/100 USB3.0	18	27	46	-
Sandisk Cruzer Edge	16	24	-	-
Sandisk Cruzer Pop	15	26	52	-
Sandisk Cruzer Fit	-	27	-	-
Toshiba	14	23	44	-
Team	-	23	-	-
Transcend USB2.0 OTG	20	40	-	-
Toshiba OTG	-	48	68	108

READY EXTERNAL HARDISK "3 Years Warranty"	500	1TB	2TB
2.5"			
Samsung S3	169	230	345
Samsung P3	188	-	-
Samsung M3	178	-	-
WD Element 3.0	179	239	359
WD Passport Ultra	193	244	374
WD Passport Metal Edition	-	269	399
WD MY Passport Wireless		613	743
Buffalo HD-PNFU3		239	
3.5"	2TB	3TB	4TB
WD MyBook 3.0	349	409	529
WD Mybook Live	390		
WD MyCloud	499	609	789

PC HARDISK 3.5" SATA 16 32 64			
Seagate			
1TB	-	-	183
WESTERN DIGITAL			
500GB Blue	168	-	-
1TB Green	-	-	181
1TB Blue	-	-	185
1TB Black	-	-	267
2TB Black	-	-	455
2TB Green	-	-	279
3TB Green	-	-	349
4TB Green	-	-	505
1TB RE4	-	-	355

PCI-EXPRESS 16x VGA CARD			
NVIDIA GEFORCE	RAM	BIT	RM
Zotac 3 Years Warranty			
GTX 750	1GB-D5	128	429
GTX 750 TI OC Dual Fans	2GB-D5	128	579
GTX 660	2GB-D5	192	590
GTX 760	2GB-D5	256	699
GTX 960 Dual Fans MGS	2GB-D5	128	790
GTX 960 Dual Fans AMP! MGS	2GB-D5	128	899
GTX 970 Reference	4GB-D5	256	1199
GTX 970 Mini	4GB-D5	256	1300
ZMAX 3 Years Warranty			
GT730	1GB-D5	64	246
GT730	2GB-D3	128	252
GTX 660	2GB-D5	192	599
GTX 750 STORM X OC	1GB-D5	128	491
GTX 750 TI STORM X	2GB-D5	128	625
GTX 750 TI STORM X DUAL	2GB-D5	128	652
GTX 780 Super Jet Stream	3GB-D5	384	1917
GTX 960 Reference	2GB-D5	128	921
GTX 960 Super Jet Stream	2GB-D5	128	1007
GTX 970 JetStreams	4GB-D5	256	1523
GTX 980 JetStreams	4GB-D5	256	2458
GTX 980 Super JetStreams	4GB-D5	256	2544
MSI 3 Years Warranty			
GT 210	1GB-D3	64	109
GT 640	2GB-D3	128	329
GTX 650 OC	1GB-D5	128	369
GT730	1GB-D5	64	259
GT730	2GB-D3	128	239
GT740	2GB-D5	128	389
GTX 750 OC	1GB-D5	128	429
GTX 750 Twin Frozr Gaming	1GB-D5	128	509
GTX 750 TI Twin Frozr Gaming	2GB-D5	128	619
GTX 960 Armor X2(Tiger)	2GB-D5	128	799
GTX 960 Twin Frozr Gaming	2GB-D5	128	929
GTX 960 GAMING 100ME	2GB-D5	128	999

Figure 5: The snapshot of price list from Cycom

PCPartPicker

PCPartPicker is one of the most popular website dedicated to custom PC enthusiasts. The website provides hardware components selection, compatibility, and pricing guidance for DIY computer builders so that they can plan the builds and budgets of their custom PCs. PCPartPicker also constantly update pricing from many popular online retailers around Australia, United Kingdom, Spain, Italy, Germany, United States, Canada, and New Zealand in order to ensure that their web contents remain fresh all the time. This will allow users to make prices and availability comparison between retailers. In addition, the website also enables users to share their custom PC build at their community forums to discuss ideas and solicit feedback. However, the website do not reflect the availability and prices of hardware components in Malaysia. Users from Malaysia may not be able to entirely rely on the custom PC builds created using website due to the price of hardware components exceeding their budgets or the hardware components are unavailable in this country. the availability and prices of hardware components in Malaysia. The website do not provide step by step guidance to assemble a custom PC to visitors but instead provide links to other websites which provide the guidance.

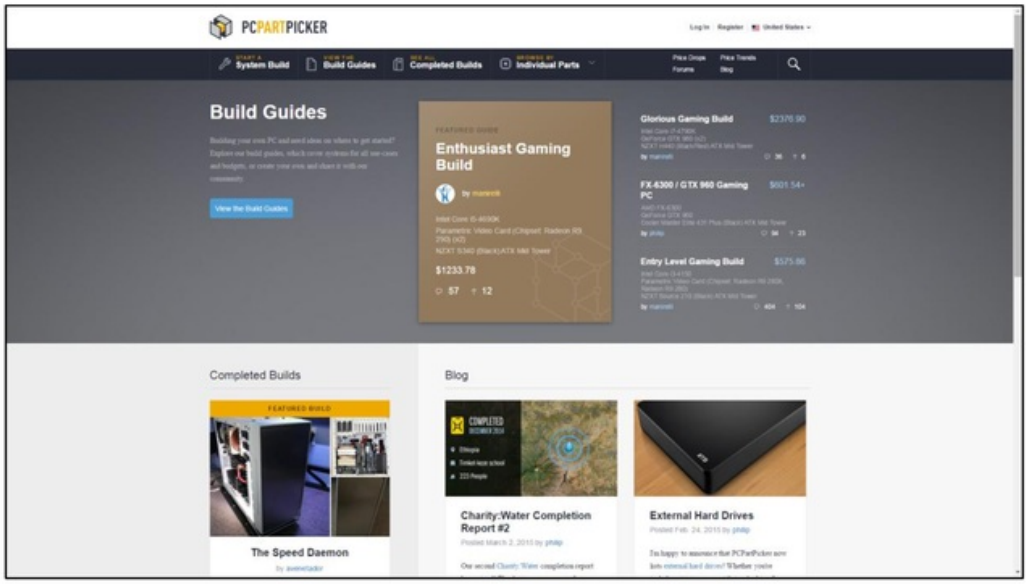


Figure 6: Home page of PCPartPicker

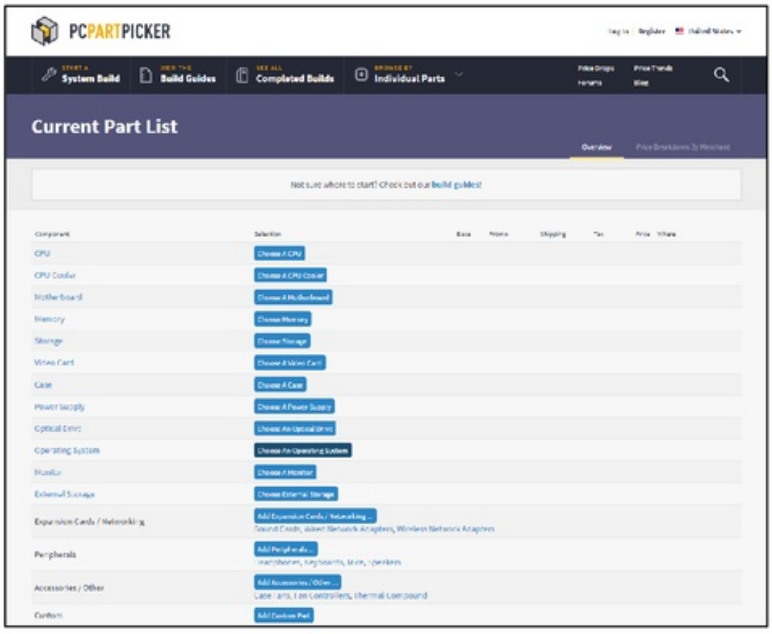


Figure 7: The page of " Build Your Own System"

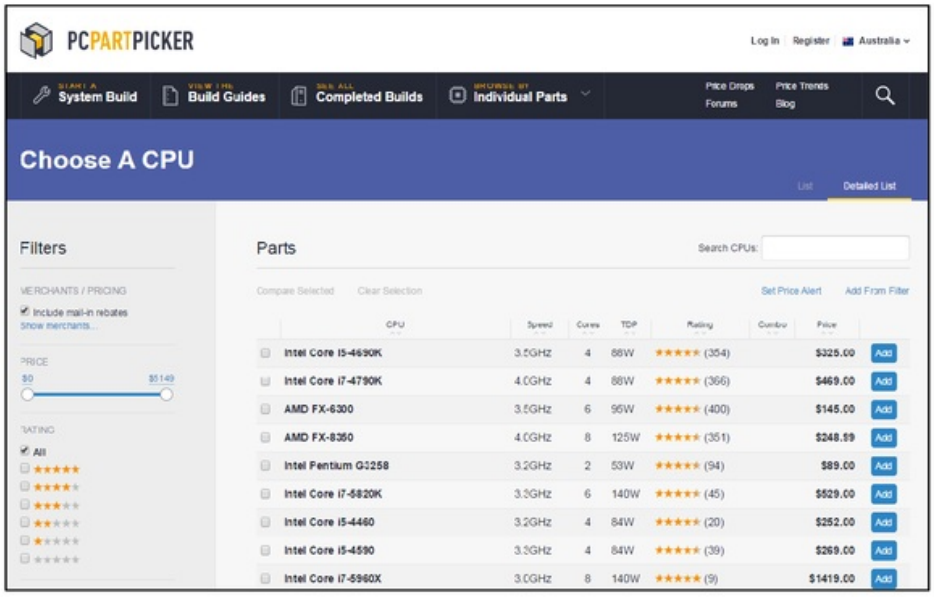


Figure 8: The page of available hardware component (CPU)

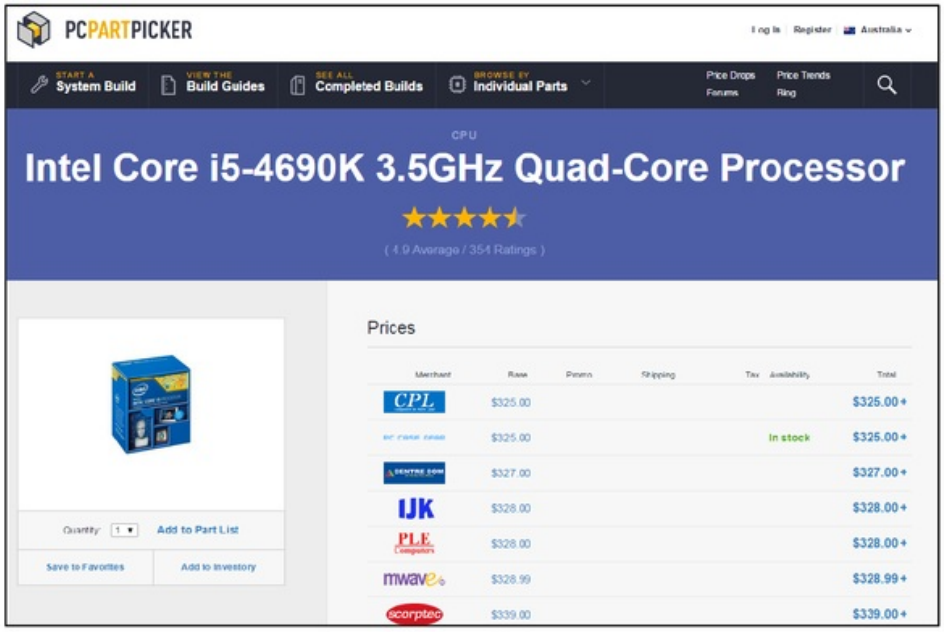


Figure 9: Hardware component's information (CPU)

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Build-Gaming-Computers.com

Build-Gaming-Computers.com is a website that provides a comprehensive guide on building a custom PC, including how to select hardware components that best suit your custom PC build and how to assemble the components into a custom PC. Despite that the website focuses on building a gaming rig, the guidance provided is still relevent for people who have different builds in their mind. However, the website heavily relies on text in conveying their installation guide and the use of image is very minimal, which may be hard to understood by beginners. It would be better if the website provide a step-by-step installation guide with pictures so that visitors can follow the guide easily without having to interpret the texts.

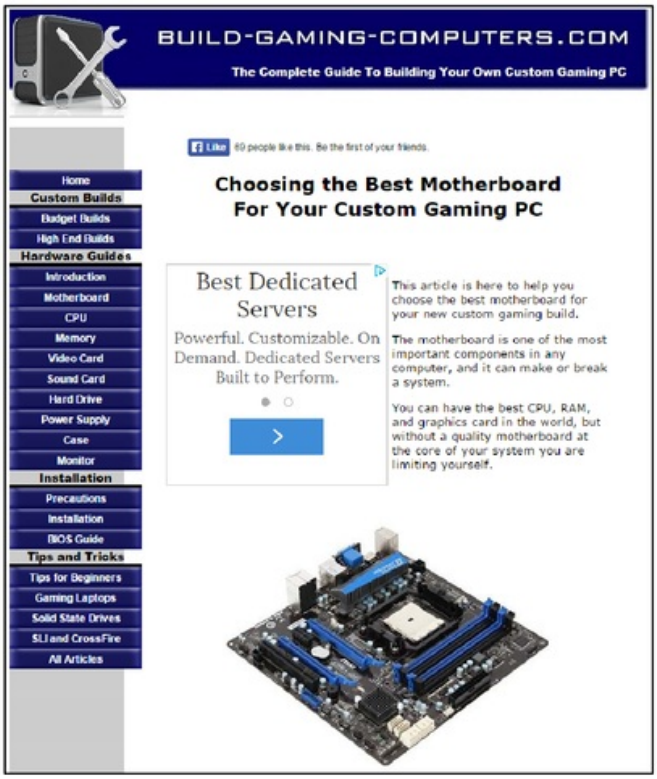

Figure 10: Home page of Build-Gaming-Computers.com

Figure 11: Step-by-step guide on installing a hardware component

2.7 Technology Comparative Study

Website/Application Features	Cycom	PCPartPicker	Build-Gaming-Computers.com	GRAB UR PC
PC hardware component guide			✓	✓
Step-by-step hardware component installation guide			✓	✓
Custom PC build planner		✓		✓
Hardware component information	✓ (pricelist)	✓		✓
Hardware component price comparison		✓		✓
Hardware component availability comparison		✓		✓
Online Sale Service				✓

Table 2: Technology Comparative Study

The author has conducted a technology comparative study to find any website/web application which serves as a one-stop center for custom PC enthusiasts and beginners but none of them are available. Each of the websites/web applications solely provide only several of the functionalities as shown in the table above. This is the reason, for the author to develop *GRAB UR PC* which will contain all of the important functionalities, as shown in the table above.

Chapter 3 – Methodology

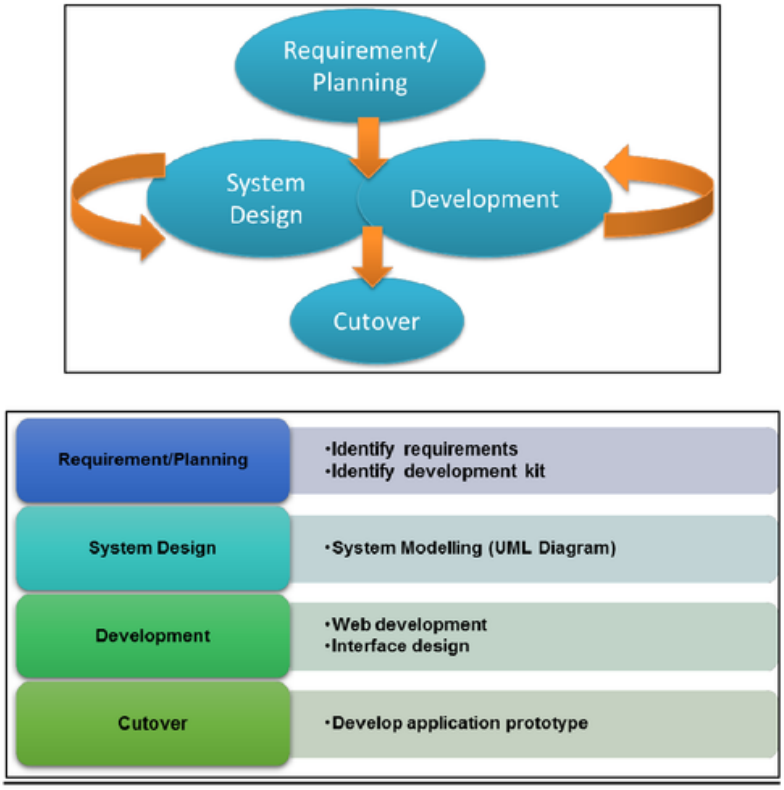

Figure 12: Rapid Application Development

3.1 Research & Development Methodology

The author has utilized the Rapid Application Design (RAD) technique as the research and development methodology of the project. RAD is defined as a software development technique which emphasizes on development process of software instead of the planning process. The methodology compels the author to adjust requirements in response to knowledge gained as the project progresses. The methodology also focuses on flexible process to enable the project to evolve instead of strictly confined to the specified requirements and specifications from planning phase. As a result, the delivery of the project could be accomplished in short period without incurring high cost. There are 4 phases in RAD, including requirement planning phase, user design phase, construction phase, as well as cutover phase.

3.2 Requirement/Planning Phase

In this phase, high level managers, technical personnel, as well as end users will identify the requirements of a system. The author has arranged several discussion sessions with his supervisor in order to identify the requirements of the project. The author has also conducted a research on the requirements of the project, which were then segregated into functional and non-functional requirements. The sketch of the graphical user interface (GUI) of the project has been drafted during this phase, as well. The GUI should be attractive but simple and user-friendly to decrease the learning curve of utilizing the project for users.

3.3 System Design Phase

In this phase, based on the requirements gathered during the Requirement/Planning phase, the author has developed the Use Case Diagram for the project. The author has also created the tables and columns for the database and enter rows of data on the hardwares into the database. In addition, the author has installed and run the web server for the website during this phase.

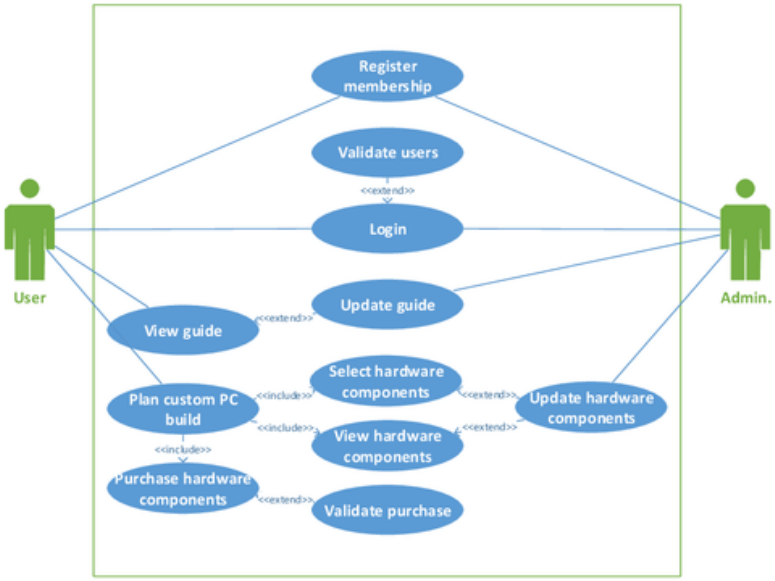

Figure 13:

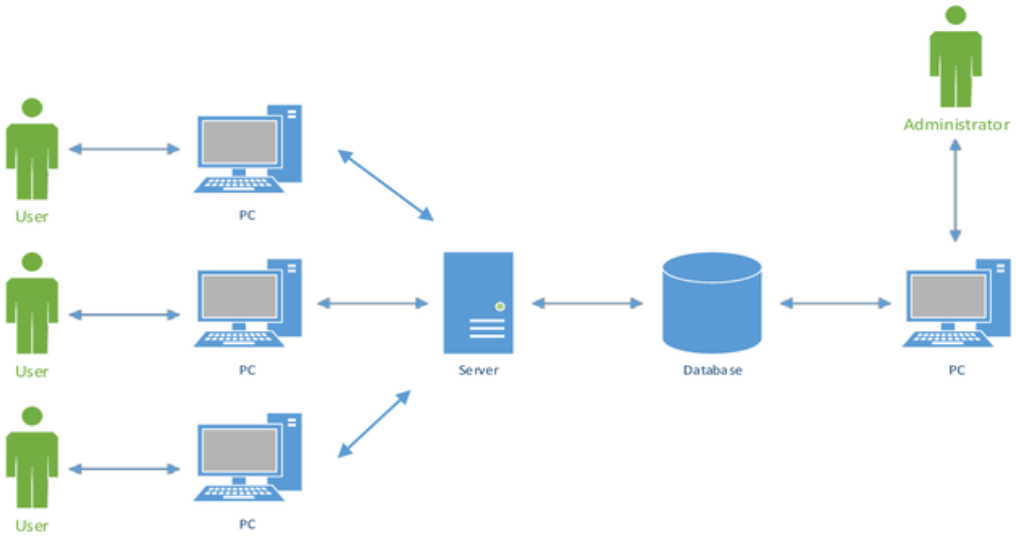

Figure 14: System Architecture

3.4 Development Phase

In this phase, the author has started the development of the project by writing the codes for the website interface and content.The author also has connected the database to the website.

3.5 Cutover Phase

During the cutover phase, the author has conducted the user acceptance test to gather feedbacks from the end users with regards to the website. The feedbacks are then used to rectify the errors as pointed out by the respondents and improve any area where they are dissatisfied with.

3.6 Tools Used

Hardware(s):

1) Desktop PC

The author has used his own desktop personal computer (PC) to develop the project. The specifications of the desktop PC is as follow:

Operating System	Windows 7 Ultimate 64-bit SP1
Processor	Intel Core i7-4790K @ 4.00GHz
Graphic	NVIDIA GeForce GTX 780 3GB DDR5 VRAM
Memory	DDR3 1600Mhz 8GB Dual Channel
Storage	120GB SSD 4TB HDD 7200 RPM

Software(s)/Other application(s):

1) MySQL 5.6 & MySQL Workbench 6.3

The author has decided to use MySQL 5.6 as the database for the website because it is open-source and free of charge. To use the database, the author has to run the database through a SQL command line. By installing MySQL Workbench 6.3, a unified visual database tool for MySQL, the author has the option to run the database through a graphical user interface (GUI). In addition, MySQL Workbench 6.3 also ntegrates SQL development, administration, database design, creation and maintenance into a single integrated development environment.

2) JavaServer Pages (JSP)

The author has decided to use JSP to develop the website because it enables the author to create dynamically generated web pages based on HTML and XML. In order to deploy and run JSP, the author has to use Apache Tomcat 7.0.63 because it is a web container with servlet that is compatible with JSP.

3) Apache Tomcat 7.0.63

The author has decided to use the Apache Tomcat 7.0.63 as the web server and servlet container for the website, since it is a requirement to deploy and run JSP. In addition, the web server is also open-source and free of charge.

4) Notepad++ V6.7.3

The author has decided to use Notepad++ V6.7.3 to write the codes for the website. It is a text editor and source code editor for use with Microsoft Windows. It is different from Notepad, the built-in Windows text editor, because it fully supports tabbed editing. This feature enables the author to work with multiple open files in a single window. In addition, the text editor is also open-source and free of charge.

3.7 Gantt Chart, Project Activities & Key Milestones

FYP I:

ACTIVITIES	JANUARY				FEBRUARY				MARCH				APRIL			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Search project topic																
Propose project topic																
Research project topic																
Submit logbook report																
Develop Introduction																
Develop literature review																
Develop methodology																
Conduct survey																
Discuss results																
Develop conclusion																
Interim report submission																
Project defense																

Table 3: Gantt Chart of the Project (FYP I)

Project Activities	Key Milestones
• Search project topic • Propose project topic • Research project topic • Develop Introduction • Develop literature review • Develop methodology • Conduct survey • Discuss results • Develop conclusion	• January – March: Submit logbook report • March – Interim report submission • April – Project proposal defense

Table 4: Project Activities & Key Milestones (FYP 1)

FYP II:

ACTIVITIES	MAY				JUNE				JULY				AUGUST			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
User Interface Design																
Website Development																
Pre-Sedex Presentation																
Technical Report																
System Execution																
System Testing																
Dissertation Report																
Viva Presentation																

Table 5: Gantt Chart of the Project (FYP II)

Project Activities	Key Milestones
• User Interface Design • Website Development • System Execution • System Testing	• July - Pre-Sedex Presentation • July - Technical Report submission • July - Dissertation Report submission • August - Viva Presentation

Table 6: Project Activities & Key Milestones (FYP II)

Chapter 4 – Results & Discussion

4.1 Questionnaire Results

FYP I:

The following are the results of the survey that the author had conducted for 5 days from 26th March 2015 to 30th March 2015 on Facebook. The survey had garnered feedbacks from 52 respondents.

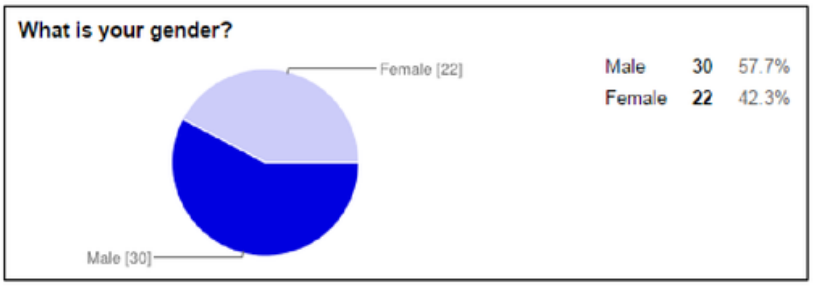

Figure 15: Percentage of Gender

Based on the result, 57.7% of the respondents are male whereas the remaining 42.3% are female. This is to important to know which gender is more interested in subjects related to custom PC.

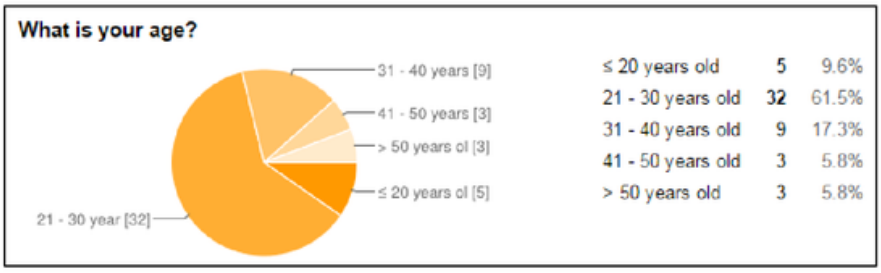

Figure 16:

Based on the result, 61.5% or majority of the respondents are of the age group of 21 – 30 years old. This is followed by 31 – 40 years old (17.3%), ≤ 20 years old (9.6%), 41 – 50 years old and > 50 years old (5.8%). It can be assumed that mostly people around 40 years

old and below who are more interested in custom PC than their older counterpart. This maybe because these generally, they are more technology savvy than older people.

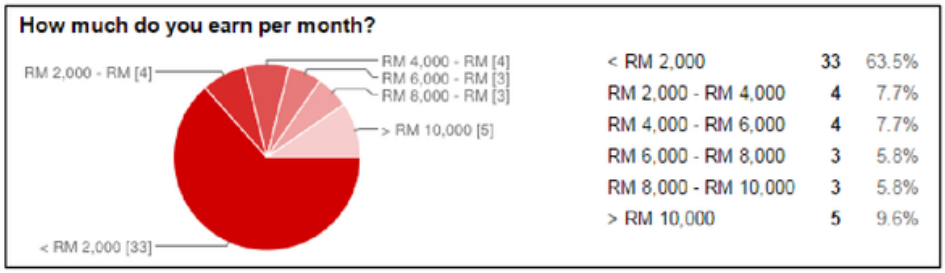

Figure 17: Percentage of Earning per month

Based on the result, 63.5% or majority of the respondents earn per month less than RM2,000. This is followed by more than RM10,000 (9.6%), RM2,000 – 4,000 and RM4,000 - 6,000 (7.7%), and lastly RM6,000 – 8,000 and RM8,000 – 10,000 (5.8%). This assumption for the result is if we look at the result of the previous question, the majority of the respondent is of the age group 21 – 30 years old (61.5%). Their earning is below RM2,000 because most of them are likely to be university students who live off monthly allowance from their parents or scholarship. As for the rest of the respondents, there is not much different between their percentages because based on their earnings per month, they clearly have jobs and might be busy with their work which may deter some of them from getting into custom PC building.

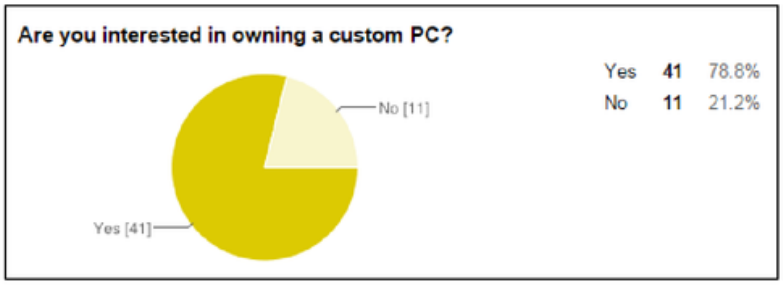

Figure 18: Percentage of interest in owning a custom PC

Based on the result, 78.8% of the respondents are interested in owning a custom PC. This may be because more and more people are starting to realize the benefits of owning a custom PC as opposed to buying a pre-built PC.

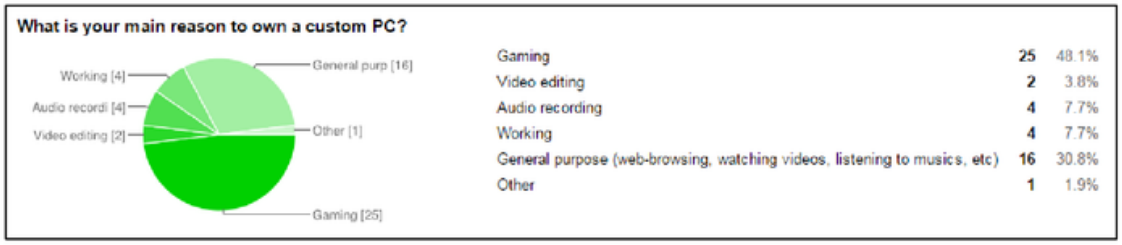

Figure 19: Percentage of Reason to Own a Custom PC

As shown above, 48.1% of the respondents wants to own a custom PC because of gaming, whereas for the 30.8% of them, it is because of general purpose such as web-browsing, watching videos, and listening to music. This may be because premium PCs for gaming are much very expensive and its much cheaper to build a custom PC for gaming with the same specification.

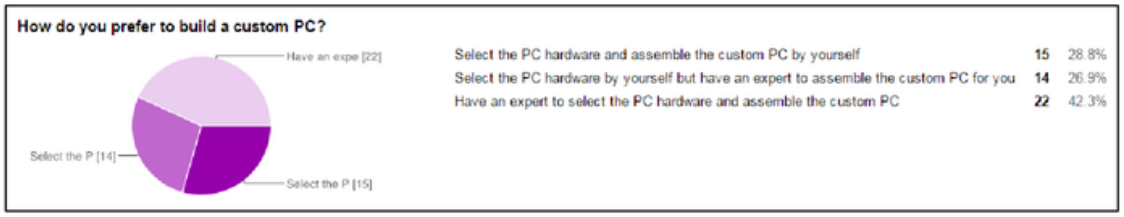

Figure 20: Percentage of Preference on How to Build a Custom PC

As shown above, 42.3% of the respondents, prefer to have an expert to select the PC hardware and assemble the custom PC, whereas 28.8% prefer to select the PC hardware and assemble the custom PC by themselves and 26.9% prefer to select the PC hardware and assemble the custom PC by themselves. This maybe because although many of them are interested to own a custom PC, they are not really knowledgeable about PC hardware and thus do not know how to assemble a custom PC. For that reason, they have decide to rely on an expert to do the job for them.

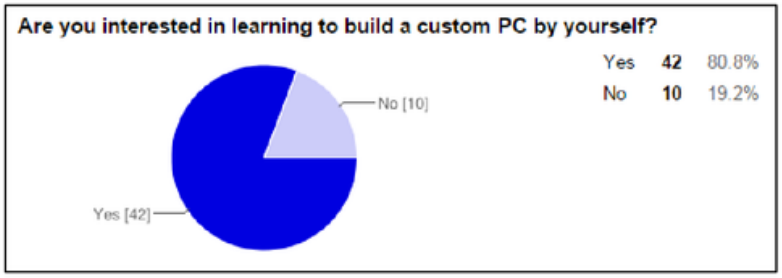

Figure 21: Percentage of Interest to Learn to Build a Custom PC by Themselves

As shown above, 80.8% are interested in learning to build a custom PC by themselves. Although in the previous question, it is theorized that most of them are not knowledgeable enough to build custom PC by themselves, the result of this question shows that they are willing to learn about it to compensate for their lack of knowledge.

For the following questions, please select the appropriate scale:

1: Strongly disagree 2: Disagree 3: Neutral 4. Agree 5. Strongly agree

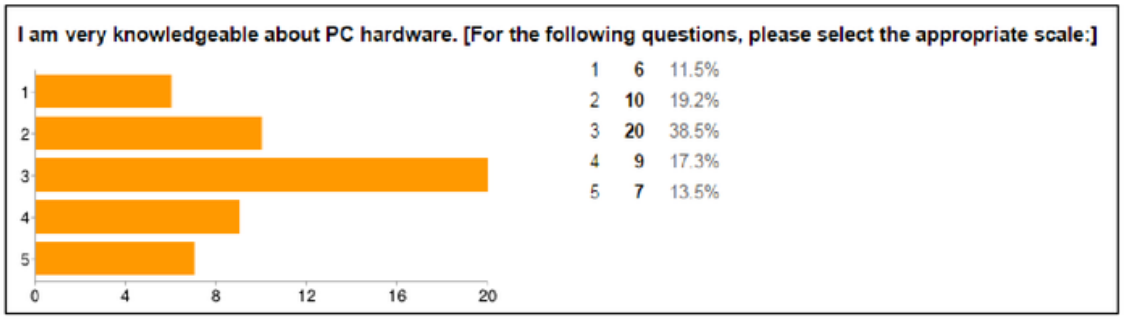

Figure 22: Percentage of Knowledge Level about PC hardware

Based on the result, it can be said that about 30.8% of the respondents are really knowledgeable about PC hardware, 38.5% are knowledgeable to limited extend, and the remaining 30.7% do not know much about PC hardware. It can be said that the number of people who know much about PC hardware are about the same as people who do not know much about them. Most of them have some knowledge about it but not too deeply, which explains why many of them are interested to learn about building a custom PC in the first place (as in the result of the previous question).

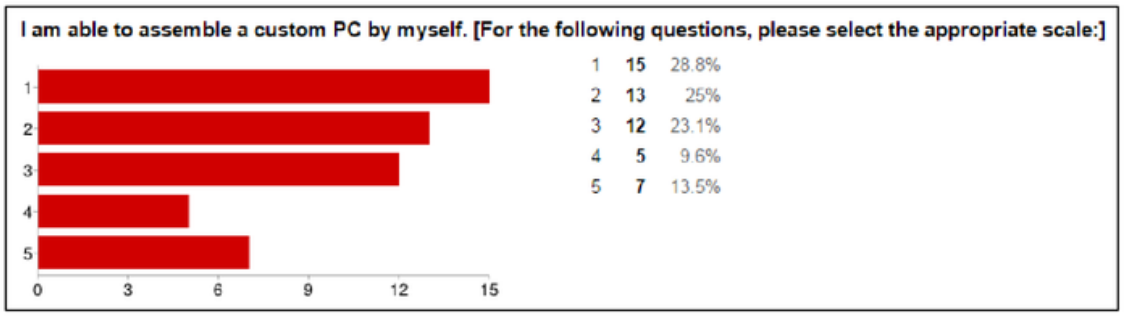

Figure 23: Percentage of Ability to Assemble a Custom PC by Themselves

Based on the result, it can be said that about 23.1% of the respondents can assemble a custom PC by themselves, 23.1% are able to assemble only some parts of the custom PC, whereas 53.8% do not know how to assemble the custom PC by themselves knowledgeable to limited extend, and the remaining 30.7% do not know much about PC hardware.This finding shows that majority of them can't assemble custom PC by themselves. Although the percentage of people who knows about PC hardware is higher

than those who do not (as in the result of the previous question), it can be speculated that they lack the practical or first hand skills to assemble the custom PC.

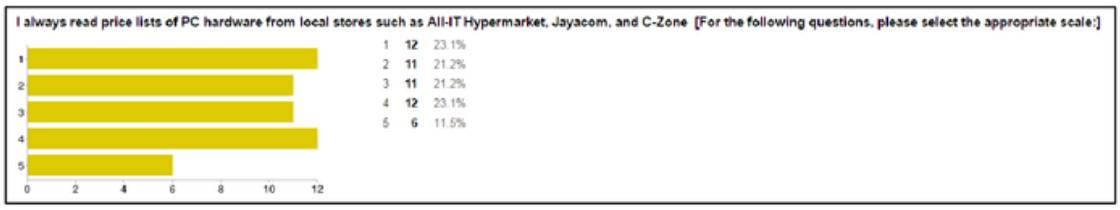

Figure 24: Percentage of People who Read Price Lists of PC Hardware

Based on the result, it can be said that about 34.6% of the respondents frequently read price lists of PC hardware, 21.2% are reading them not really frequently, whereas 44.3% rarely or never read them. This finding shows that many of them indeed follow the update on prices and availability of PC hardware in Malaysia because they are genuinely interested about building a custom PC and the rest of them do not really care enough about the update.

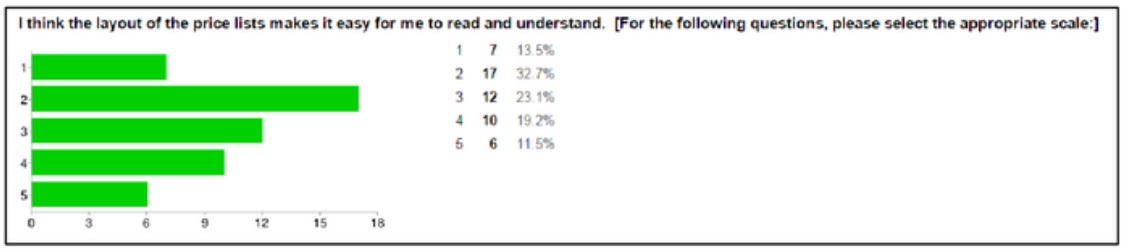

Figure 25: Percentage of Perception of the User-friendlyness of Price List

As shown above, about 30.7% of the respondents think that the layout of the price lists are easy to read and understandable, perhaps because they are already used to them from from frequently reading them. But about 46.2% find them otherwise, either because they are not used to them because they seldomly read them or the layout is really not user-friendly itself.

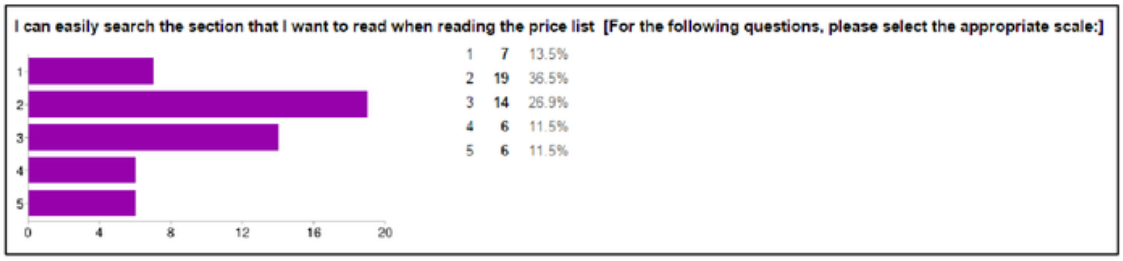

Figure 26: Percentage of Searchability of Price List

As shown above, about 23.0% think that they can easily search the section that they want to read when reading the price list. 29.6% neither agree nor disagree with the statement but 50.0% or half of them disagree with it. This could be because many of them are not used to the layout of the price lists, the might appear confusing to the respondents that they are having a hard time to search the section that they specifically want to read.

4.2 User Acceptance Test Results

FYP II

The following are the results of the user acceptance test that the author had conducted for 5 days from 23rd July 2015 to 27th July 2015. A total of 20 persons have been asked participate in the user acceptance test. All of the respondents are students in Universiti Teknologi PETRONAS of the age group 18 – 24 years old and they are familiar with using a PC. After testing the website, the respondents had been asked to fill in a questionnaire to gather their feedback with regards to the website.

The following are the questions included in the questionnaire:

1) How do you rate the functionality of the application in terms of performance?
2) How do you rate the user interface design of the application?
3) How do you rate the application in terms of user-friendliness?
4) How do you rate the operational performance of the application?
5) I think the application can help user to learn about custom PC.
6) I think the application can help user to plan their custom PC build.
7) I understand the information provided by the application.

8) I would rather use the application than personally refers to the sellers and helpers at the PC stores.

User Acceptance Test Form

Title : GRAB UR PC - Website on Custom PC Build Guide & Planner
Developer : Mohd Shahrizan Bin Sabli
Student ID : 16295
Programme: Business Information System

1.Gender : _____

2. Age : _____

In the scale of 1-5, Please tick the best option for the following questions

(5=Excellent, 4=Very Good, 3=Good, 2=Poor, 1=Very Poor)

No	Question	Very Poor	Poor	Good	Very Good	Excellent
1.	How do you rate the functionality of the application in terms of performance?					
2.	How do you rate the user interface design of the application?					
3.	How do you rate the application in terms of user-friendliness?					
4.	How do you rate the operational performance of the application?					

5.	I think the application can help user to learn about custom PC					
6.	I think the application can help user to plan their custom PC build					
7.	I understand the information provided by the application.					
8.	I would rather use the application than personally refers to the sellers and helpers at the PC stores.					

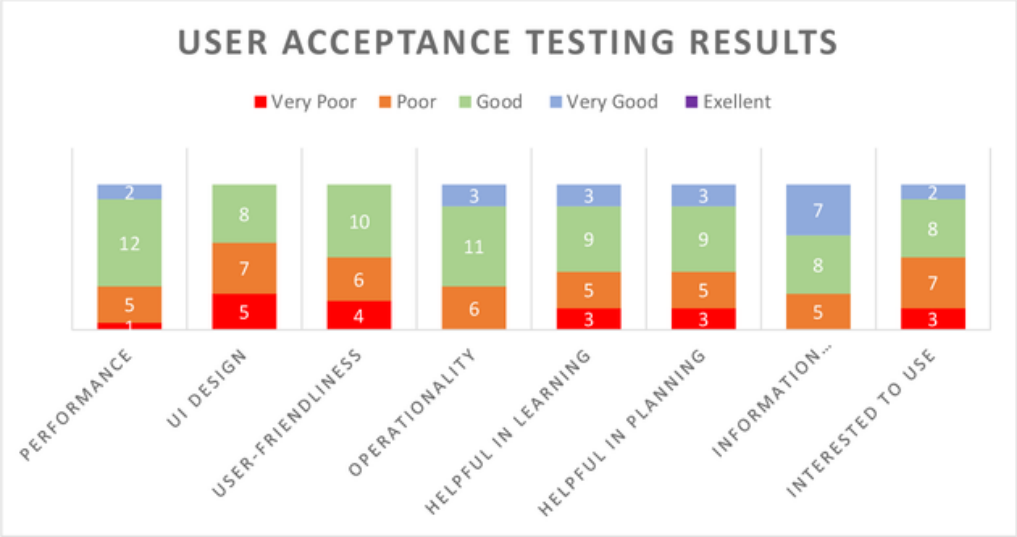

Figure 27: User Acceptance Testing Results

The rating is from 1 to 5 with rating 1 signifying very poor and rating 5 signifying excellent by the respondents. Most of the respondents agree the website's performance is good and they have no difficulty to run the website. In addition, most of the respondents think that the operationality of the website is good. and they. They responded as well that the website is helpful to them in learning about custom PC and planning their custom PC builds. Besides, most of the respondents find that the information provided in the website as good and beneficial.

Nevertheless, many of the respondents find the user interface design as poor and needs to be improved. Half of the respondents also find that the website is user-friendly while the remaining half find it otherwise. For these reasons, the author has decided to make it a priority to re-designed and improve the user interface to make it more easier to use and attractive to users. The respondents are also divided when it comes to their interest in using the website. Half of the respondents prefer to use the website in helping them to build their own custom PC while the other half prefer to personally refer to the sellers and helpers at the PC stores to help them building their own custom PC.

4.3 GRAB UR PC

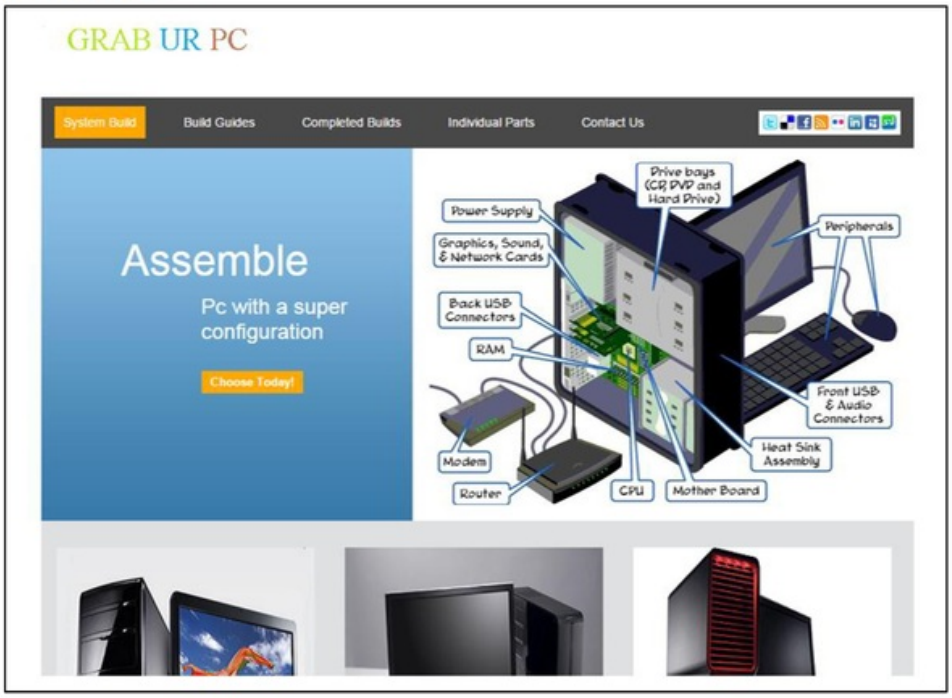

Figure 28: "Home" page

The figure above is the home page of the *GRAB UR PC* website. From this page, visitors can navigate to other pages including *System Build*, *Build Guides*, *Completed Builds*, and *Individual Parts* by clicking on their respective tabs.

Figure 29: "System Builds" page

By clicking on the *System Builds* tab, users will be redirected to the *System Builds* page. On this page, users can plan the build of their custom PC by selecting the hardwares for the custom PC. The hardwares are categorized based on their types as shown in the figure above: *CPU*, *CPU Cooler*, *Motherboard*, *Memory*, *Storage*, *Video Card*, *Case*, *Power Supply*, *Optical Drive* , *Operating System*, and *Monitor*. When users click on any of the hardwares, they will be redirected to their respective *Individual Parts* pages. For example, when users click on the *CPU*, they will be redirected to the *Individual Parts – CPU* page.

Figure 30: "Individual Parts" page

On Individual Parts – CPU page, users can view information regarding each CPU in the list, including the clock speed, the number of cores, the thermal design power (TDP), the user rating and the price. The information and price of hardwares in the list are compiled from price lists published by C-Zone, Cycom, and Jayacom. Users can add their desired hardwares to their build plan on *System Builds* page by clicking on the *ADD* button.

Figure 31: "System Builds" page

Each time users add a hardware to their build plan on *System Builds* page, it wil calculate the total cost of their custom PC build. In case they want to replace any of the hardware that they have added to their build pan, users simply need to click again on the hardware button (for example, if they want to replace the CPU, they only need to click on the *CPU* button) and they will be redirected to its respective *Individual Parts* page.

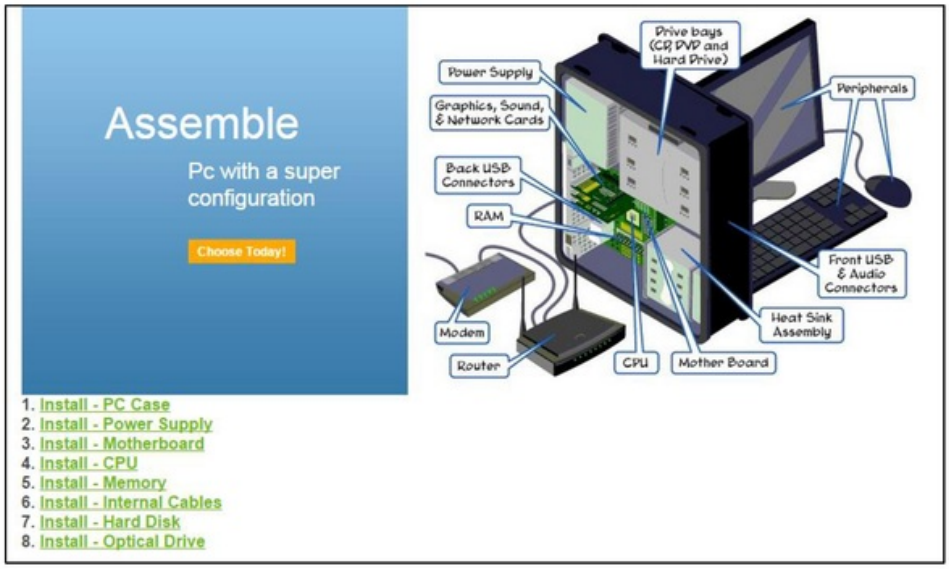

Figure 32: "Build Guides" page

When users click on *Build Guides* tab, they will be redirected to the *Build Guides* page. On this page, users will be guided on how to choose the hardwares based on their intended custom PC build, as well as how to install the hardwares.

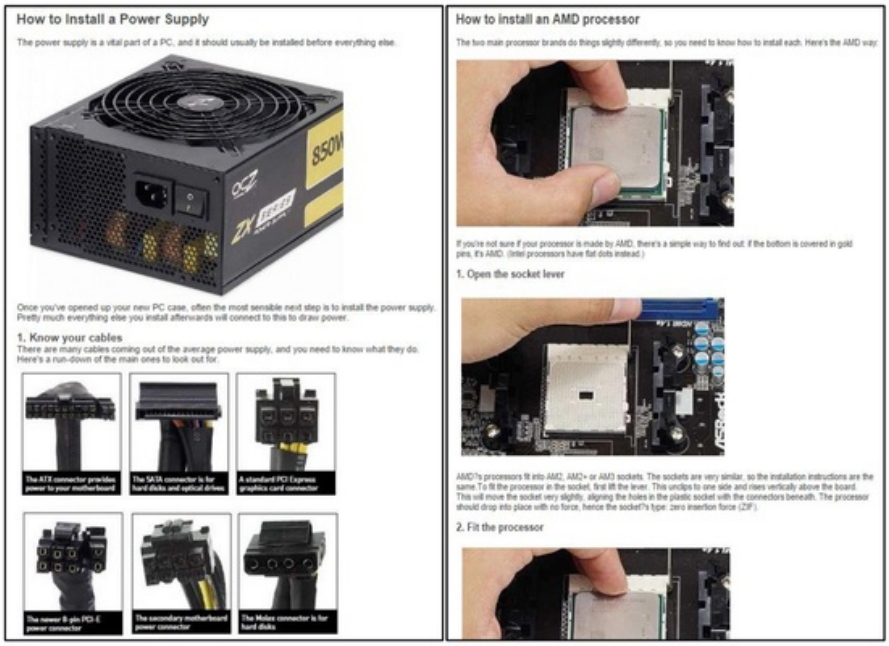

Figure 33: "Build Guides" page

The guides has been divided into 10 sections based on their categories: *Install – PC Case*, *Install –Power Supply*, *Install – Motherboard*, *Install – CPU*, *Install – Memory*, *Install – Internal Cables*, *Install – Hard Disk*, *Install – Optical Drive*, *Install – Video Card*, and *Install – Operating System*. Diagrams are included with each guide so that users can understand the guide better. If users want to see the guide for CPU, they simply have to click on the *Install – CPU* button and they will be redirected to the *Install – CPU* page.

Chapter 5 – Conclusion & Recommendation

The research conducted by the author during the early stages of the project is to find the functionality that should be included in the project, including the basics of custom PC and its installion guide, custom PC build planner to determine the builds and budget, as well as online sale service for purchasing hardware components. It is also to identify the aim of the project, which is to develop a one stop centre web application which provides the aforementioned functionalities.

It can be concluded that based on the survey results, although many are not knowledgeable about custom PC, they still are interested in owning a custom PC and willing to learn to about custom PC. As for the user acceptance testing results, many respondents find that the *GRAB UR PC* is acceptable in terms of system performance and operationality and it helps them to learn about custom PC and plan their custom PC builds. However, they also request the author to improve the user interface design to make it more attractive and enhance its user-friendliness for ease of use.

To improve the website, the author had decided to rectify the problems as stated by the respondents in the user acceptance test by enhancing its user interface and user-friendliness. The author has also planned to include price lists from major hardware components retailers from the whole country. In addition, the author is interested to include guidance on advance technique to improve performance of custom PC, such as overclocking a CPU and GPU. Another suggestion is to create a forum for visitors to share their custom PC builds and discuss them.

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Appendices

Appendix 1: Questionnaire for the project

Custom PC Building Guide & Planner

I am conducting a survey for my current Final Year Project. The project is titled "Custom PC Building Guide & Planner". It is basically a web application that guide you on how to build a custom PC from scratch. The application also allows you to plan your custom PC build and estimate its total cost by selecting the PC hardware from a price list compiled from several local PC hardware stores. Your cooperation in this survey is highly appreciated.

*Required

What is your gender? *

- Male
- Female

What is your age? *

- ≤ 20 years old
- 21 - 30 years old
- 31 - 40 years old
- 41 - 50 years old
- > 50 years old

How much do you earn per month? *

- < RM 2,000
- RM 2,000 - RM 4,000
- RM 4,000 - RM 6,000
- RM 6,000 - RM 8,000
- RM 8,000 - RM 10,000
- > RM 10,000

Are you interested in owning a custom PC? *

- Yes
- No

What is your main reason to own a custom PC? *

- Gaming
- Video editing
- Audio recording
- Working
- General purpose (web-browsing, watching videos, listening to musics, etc)
- Other:

How do you prefer to build a custom PC?

- Select the PC hardware and assemble the custom PC by yourself
- Select the PC hardware by yourself but have an expert to assemble the custom PC for you
- Have an expert to select the PC hardware and assemble the custom PC

Are you interested in learning to build a custom PC by yourself? *

- Yes
- No

For the following questions, please select the appropriate scale: *

1: Strongly disagree 2: Disagree 3: Neutral 4. Agree 5. Strongly agree

	1	2	3	4	5
I am very knowledgeable about PC hardware.					
I am able to assemble a custom PC by myself.					
I always read price lists of PC hardware from local stores such as All-IT Hypermarket, Jayacom, and C-Zone					
I think the layout of the price lists makes it easy for me to read and understand.					
I can easily search the section that I want to read when reading the price list					

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